Switches of Holocene temperature-precipitation correlations in northern Hemisphere extra-tropics comparing proxy and model data

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Future precipitation response to warming remains uncertain because climate models poorly reproduce observed changes of temperature-precipitation correlations. However, restricting model validations to the observational period may yield misleading conclusions due to the complexity of the involved processes. Our analyses of Holocene proxy-based temperature-precipitation correlations from 1500 northern Hemisphere extratropic pollen records portrayed significant latitudinal dependance, temporal changes from the early to late Holocene as well as differences between short and long time-scales. These observed variations were found to be mostly consistent with patterns simulated by Holocene transient climate simulations. Our results suggest that the strength of positive temperature-precipitation correlations in high-latitudes is sensitive to the background temperature while monsoonal subtropics reflect spatial shifts of circulation systems; and correlation sign switches in mid-latitudes relate to changes of westerlies strength. We conclude that regional and continental climate change on land is more complex than the expected “wetter climate in a warmer world” assumption which holds well at the global scale. On the other hand, long-term projections of precipitation may be better than previously thought as major processes seem to be already implemented correctly in general circulation models.